

## METHOD OF DETERMINING INITIAL TRANSMISSION POWER

### BACKGROUND OF THE INVENTION

The present invention generally relates to methods of determining initial transmission power, and more particularly to a method of determining initial transmission power when controlling the transmission power during a call between mobile stations or between a mobile station and a fixed network in a mobile communication system which uses digital mobile telephones or the like.

FIG. 1 shows an example of the system structure of a digital mobile telephone system. In FIG. 1, there are shown mobile stations a and b, base stations A and B, a switching center E, and a fixed network N. The base stations A and B each include a common amplifier unit and a modem unit, and the switching center E includes a switching unit and a base station controller. In this mobile telephone system, when the transmission power (down transmission power) of the base station or the transmission power (up transmission power) of the mobile station is too large, the radio wave wraparounds to an adjacent zone and there is a possibility that the communication between other stations in the adjacent zone may be affected by interference caused thereby. For this reason, it is necessary to control the up and down transmission power to optimum values.

The control of the up transmission power is carried out as follows. That is, the base station measures the reception level of a talking channel signal from the mobile station and instructs the transmission power to the mobile station so that the measured reception level approaches a predetermined up reference reception level. The mobile station adjusts the up transmission power depending on this instruction from the base station.

On the other hand, the control of the down transmission power is carried out as follows. That is, the mobile station measures the reception level of a talking channel signal from the base station and notifies the measured reception level to the base station. In response to this notification from the mobile station, the base station adjusts the down transmission power so that the measured reception level approaches a predetermined down reference reception level.

FIGS. 2 through 7 are diagrams for explaining the control sequence of the up and down transmission powers. FIGS. 2 and 3 show the control sequence of the down transmission power when calling from the mobile station. FIG. 4 shows the control sequence of the down transmission power when the mobile station is called. FIGS. 5 and 6 show the control sequence of the up transmission power when calling from the mobile station. In addition, FIG. 7 shows the control sequence of the up transmission power when the mobile station is called.

First, a description will be given of a case where a call is made from the mobile station so as to talk with another mobile station or a fixed network via the base station, by referring to FIGS. 2 and 3 and FIGS. 5 and 6.

In a standby mode, the mobile station measures the reception level of signals from an own zone in which the mobile station is located and the reception level of signals from a peripheral zone which is adjacent to the own zone, and stores these reception levels in a measured data storage 9. When a call request is generated, the mobile station sends a calling radio state report having a format shown in FIG. 8 to the base station. As shown in FIG. 8, the calling radio state report includes the reception level of the own zone which is

measured during the standby mode and stored in the measured data storage 9, and a mobile station type 11 which has a format shown in FIG. 9 and indicates the maximum transmission power with which the mobile station can transmit (3 W in the case of a 3 W mobile station, and 2 W in the case of a 2 W mobile station).

An up transmission power 12 of the mobile station when sending the calling radio state report is controlled by an autonomous transmission power controller 10. In other words, the reception level of the own zone measured in the standby mode is compared with a predetermined threshold value, and the magnitude of the transmission power is autonomously controlled and reduced if the reception level is greater than the predetermined threshold value. This control, however, is carried out using a maximum transmission power which can be output as a reference (maximum transmission power reported from the base station by report information 1).

When the base station receives the calling radio state report, the base station notifies the contents of the calling radio state report to the base station controller of the switching center. If the reception level of the own zone reported in the calling radio state report satisfies a sufficient quality, the base station controller allocates a free talk channel of the own zone with respect to the mobile station by a channel allocator 4, and instructs the allocated talk channel to the mobile station by a radio channel designation. This radio channel designation has a format shown in FIG. 10.

The control of the down transmission power of the talk channel from the base station to the mobile station is carried out as shown in FIGS. 2 and 3. First, when the talk channel is instructed by the radio channel designation, the mobile station starts the call by shifting to the instructed talk channel. A down transmission power 7 of the base station immediately after the start of this call is an initial transmission power value 6 which is a predetermined fixed value. The mobile station measures the reception level of the down-line transmitted at the initial transmission power value 6 by a reception level measuring unit 13, and reports the measured result to the base station.

At the base station, the reported reception level of the down-line is compared with a predetermined down reference reception level by a transmission power value determining unit 8, and makes a transmission at a down transmission power 7' which is determined so that the reported reception level of the down-line converges to the down reference reception level. Thereafter, the base station successively controls the down transmission power until the call is terminated, based on the down reception level which is successively reported from the mobile station, so that the reported down reception level converges to the reference reception level.

The control of the up transmission power from the mobile station to the base station is carried out as shown in FIGS. 5 and 6. The operation up to the point where the base station makes the radio channel designation with respect to the mobile station is the same as that described above in conjunction with FIG. 2. However, in this case, an initial transmission power value 22 of the mobile station is also notified when making the radio channel designation. An up transmission power 18 of the mobile station immediately after the mobile station shifts to the talk channel and starts the call is this initial transmission power value 22 which is notified and is a predetermined fixed value.

The base station measures by a reception level measuring unit 19 the reception level of the up-line transmitted from the